REMARKS

Applicants have carefully considered the arguments advanced by the Examiner in continuing the restriction requirement in this application and respectfully request reconsideration and withdrawal of the restriction requirement in view of the above amendments to the claims to more particularly point out and distinctly claim the invention to place them in better form to more clearly present a single invention for examination. No new matter is added and no additional issues are presented by way of the amendments.

Applicants have carefully reviewed the cited references and considered the arguments advanced by the Examiner in rejecting the claims under 35 U.S.C. § 103 and respectfully request withdrawal of the rejections for the following cogent reasons.

Election/Restrictions

Applicants respectfully submit that the Examiner may not fully appreciate the present invention based on the Examiner's conclusion that the insertion of the phrase "continuous coil" into the claim is merely an attempt to amend around the restriction requirement. The Examiner assumes that the "continuous coil" phrase has no patentable weight and merely describes an intermediate product rather than a final product. The Examiner assumes that the finished lamp products are cut out of these coils into relatively small specified shapes and as a further consequence, the Examiner assumes that these "end product lamps" could be made by other fabrication processes and that the specific process is irrelevant. The Examiner concludes the product claims are distinct from the process and apparatus claims. Applicants respectfully disagree with the Examiner's assertions and traverse the Examiner's requirement.

Claim 1 has been amended to further clarify that the continuous laminating of the front substrate and the rear substrate produce a continuous roll of EL lamp laminate material. Therefore the process claims, claims 1-10 and 21-39, Group I and the apparatus of claims, claims 11-20, Group II include the limitation of producing a continuous roll of EL lamp laminate material. The product claims, claims 40-50, Group III are also clarified to clarify the limitation that a continuous coil laminate of front electrode laminate and rear electrode laminate formed the continuous roll of EL lamp laminate material. All the claims in the application are intimately interrelated and clearly present a single invention for examination purposes and therefore should be examined together for reasons of efficiency and to avoid a later charge of double patenting.

Applicants' invention clearly contemplates a large scale continuous coil electroluminescent lamp laminate material which itself is an EL lamp and illuminates when the proper powering voltage is applied. These lamps are large surface areas typically up to 12,000 square inches. Applicants enclose herewith as Exhibit A, five photographs showing the continuous roll EL lamp laminate material outlining their building facility which facility is approximately 250 feet by 100 feet. Applicants also enclose a photograph in Exhibit A showing the continuous roll EL lamp laminate material illuminating the interior of a building wherein the area shown in the photograph and measures approximately 41 feet in length. Applicants submit that the continuous coil EL lamp laminate material is a valid end product utilizing novel construction processes and apparatus and cannot be made using existing known EL fabrication techniques. Applicants submit that the continuous coil fabrication techniques disclosed and claimed in the application are novel and represent the only unique method to make such

continuous coil EL lamp laminate material. Accordingly, Applicants submit that consideration and examination of all of the claims of the application are proper and request favorable reconsideration and withdrawal of the election/restriction requirement.

Claim Rejections 35 U.S.C. § 112

Claim 47 is amended as set forth above to particularly point out and distinctly claim the subject matter which Applicants regard at the invention. As so amended, Applicants respectfully request withdrawal of the rejection of claim 47 under 35 U.S. C. § 112, second paragraph.

Claim Rejections 35 U.S. C. §103

The Examiner rejects claims 40 and 41 under 35 U.S.C. § 103(a) as being unpatentable over Appelberg U.S. Patent No. 5,045,755 in view of Hora U.S. Patent No. 6,107,735.

In forming the basis of the rejection, the examiner assumes that a vapor deposited aluminum layer is the equivalent to a continuous coil laminated aluminum foil layer, and therefore the method of placing the aluminum layer is irrelevant. Applicants submit the examiner is in error and the reasoning is faulty for at least the following reasons. A vapor deposited aluminum rear electrode (layer) is very different from an aluminum foil rear electrode (layer). Although they both function as a rear electrode, the aluminum foil layer is technically and materially different from and is far superior to vapor deposited aluminum as a rear electrode layer. The aluminum foil layer constitutes an improvement in EL lamp laminate material not possible with vapor deposited aluminum, and further a vapor deposited aluminum layer cannot be interpreted as a continuous coil as will become readily apparent from the following discussion.

First, there is a difference in the thickness of the layers wherein the vapor deposited aluminum is approximately 0.03 micron thick and the aluminum foil is generally in the range of 25 microns thick. The thicker aluminum layer in the provided continuous coil of aluminum foil polyester film laminate as disclosed and claimed by Applicants is superior to the thinner vapor deposited aluminum layer for at least the following reasons:

HIGHER CURRENT CARRYING CAPACITY

Applicants continuous coil thicker aluminum foil layer can carry significantly higher electrical current flow than the thinner vapor deposited aluminum layer electrode. Applicants currently manufacture an EL lamp laminate material size of 12,500 square inches. The total current for that size lamp is 6 to 7 amperes. As processes improve as specified in the application, larger lamps are envisioned in the future. The vapor deposited aluminum cannot carry that much current. It would extremely difficult if not impossible to deposit a vapor deposited aluminum layer in a continuous fashion to the thickness needed to carry the required current on an organic EL lamp construction. Therefore, fundamentally, aluminum foil is far superior for the fabrication of large-scale electroluminescent lamp laminate material and is, in fact, the only possible aluminum candidate.

MOISTURE BARRIER

Part of the construction parameters for fabricating this type of EL lamp laminate material is to provide a moisture barrier to keep moisture out of the active layers. The front substrate which is typically a clear conductive thin film coating on a substrate such as PET, is a good moisture vapor barrier. A rear electrode fabricated from a vapor deposited aluminum coating in the range

of 0.03 micron, is a poor moisture vapor barrier and will allow moisture to penetrate the active layers of the EL lamp. A rear electrode fabricated from a 25 micron aluminum foil is an excellent moisture vapor barrier and will block moisture from penetrating the active layers of the EL lamp. This is because at 25 microns it is pin-hole free and is essentially hermetic.

DURABILITY

The 25 micron aluminum foil rear electrode is a much more durable and robust rear electrode. The aluminum foil is rated as dead-soft foil, having a high ductility while maintaining its properties. Applicants' EL lamp laminate material, due to its flexibility can wound around tight radii are on occasion folded back on themselves to change direction. This flexibility is possible with a 25 micron foil rear electrode, while it is not possible with a 0.03 micron vapor deposited rear electrode. The stresses of folding and bending an EL lamp with a vapor deposited rear electrode would degrade the properties of a vapor deposited layer because of its thinness. The current carrying capabilities of the vapor deposited layer would be further reduced because its thickness would be reduced at the folds or bends. There would also be outright microcracks in the aluminum layer further diminishing its ability to function on an electrode.

RESISTANCE TO CORROSION

The 25 micron aluminum foil layer is much more corrosion resistant than a vapor deposited aluminum layer for several reasons. First, it is protected on the exterior by a layer of polyester (PET) film laminated to it. The inside of course is coated with barium titanate coating and is also protected. Second, at 25 microns of thickness, any moisture that does penetrate the PET layer will not substantially affect the electrodes performance even if a slight oxide film does form over

long time intervals. In contrast, the functioning of a 0.03 micron vapor deposited aluminum electrode is much more likely to be severely degraded by any level of corrosion because it substantially reduces thickness of the remaining conductor, and, unless an extra protective layer is added to the lamp construction at extra processing steps and cost, this electrode is exposed and would degrade rapidly.

UNOBVIOUS DIFFERENCE

In view of the foregoing and for at least the reasons set forth, Applicants submit there is an unobvious difference between the claimed product and the prior art as a result of Applicants' continuous coil of aluminum foil polyester film.

BARIUM TITANATE LAYER

The examiner asserts that inclusion of a barium titanate layer is known in the art of EL fabrication and that it would have been obvious to add a barium titanate layer to the Appelberg construction. Applicants respectfully disagree with the Examiner's conclusion.

One of the major purposes of the present invention is to disclose an improved large-scale EL lamp laminate material and disclose fabrication technique(s) to produce that EL lamp method. One of the primary improvements as discussed above is the use of a continuous coil aluminum foil as the rear electrode. Having demonstrated the advantages of using aluminum foil in the functioning of the EL lamp laminate material, one must then demonstrate a plausible method to fabricate this new construction. One cannot just glue an aluminum foil layer to the back of an existing EL lamp construction with or without a barium titanate layer. The resulting lamp would have poor light emitting characteristics because of the power losses across the glue layer which

would act as insulator. If a barium titanate layer was coated on the Appelberg construction, how would the foil be attached? The Examiner has not shown and not provided any reference which discloses how to attach foil to barium titanate as suggested by the Examiner.

The construction disclosed in Applicants' application, represents a dramatic improvement over Appelberg. In Appelberg, a UV-curable binder was coated onto an ITO/PET substrate, phosphor was electrostatically deposited onto the wet binder, the binder was UV cured, a second UV-curable coating was coated over the phosphor and again UV cured. That construction was metallized using vapor deposited aluminum which as shown above does not and cannot provide the desired construction and intended results.

In contrast, Applicants disclose in the present invention a construction that replaces the vapor deposited aluminum with a continuous coil aluminum foil. To accomplish this, a separate rear substrate of foil/PET is coated with barium titanate bearing organic binder in a solvent slurry and dried through a drying oven. This resultant rear substrate is laminated to a modified front substrate, which is an improvement over Appelberg, using heat and pressure to create a finished coil of EL lamp laminate material with many improved features.

In Applicants' invention as disclosed and claimed, the voltage impedance function of the barium titanate and the light reflection of the barium titanate improve lamp performance compared to the Appelberg reference cited by the Examiner. What is novel is that Applicants use the barium titanate layer, which is an active layer in the EL lamp, also as the heat-sealable glue layer to laminate the front and rear substrates together to complete the lamp construction and further applying it to an improved front substrate. By laminating the barium titanate layer to a

phosphor layer with the tops of the phosphor particles sticking out as disclosed in the specification, a more efficient lamp is created. Applicants' construction cannot be made using traditional EL lamp fabrication techniques to make large-scale EL lamps. Applicants' fabricating techniques as disclosed and claimed are used to make continuous coils of EL lamp laminate material as finished products. It is Applicants' novel concepts that enable the utilization of the superior benefits of aluminum foil as the rear electrode for large-scale EL lamps. The use of a barium titanate layer for the purpose of and as the heat sealable glue layer to laminate the front and rear substrate is not shown, disclosed, taught or suggested by the prior art cited by the Examiner.

Applicants submit that independent claim 40 is technically and patentably distinguishable over the references cited by defining a continuous roll of EL lamp laminate material. Applicants further submit that the continuous roll of EL lamp laminate material made in accordance with the present invention as disclosed and claimed provides an unobvious difference and improvement over the prior art.

Regarding claim 41, applicants submit it is fundamental to the construction of any EL lamp that control of the thickness of the phosphor layer is crucial to the functioning of the lamp. If the phosphor layer is too thick, there is waste of phosphor and the lamp brightness is dim. As the layer gets thinner, the lamp gets brighter until a critical thickness is reached where the lamp gets dimmer again. This critical thickness is different for every construction but is a function of the size of the phosphor particles. Applicants' present invention uses a novel and unobvious concept that provides a dramatic improvement over Appelberg and a superior EL lamp laminate

material by further positioning the phosphor particle layer using a calendaring technique to set the phosphor particles precisely into the UV-curable binder.

Further, to better accomplish this, Applicants employ a further unobvious process of partially curing the UV-binder to make it practical to calendar. This partial curing of the UV-curable binder again is a novel concept not suggested or disclosed in the prior art. The end result is Applicants' invention has the ability to further define the thickness of the phosphor layer which is fundamental to the fabrication of an EL lamp laminate material and particularly as a continuous roll. It should also be clear from the foregoing that the process and the resulting product are intimately interrelated to each other. Applicants' invention incorporates previously undisclosed and unobvious manufacturing techniques to produce a continuous roll EL lamp laminate material not disclosed, suggested or taught by the cited prior art.

The Examiner rejects claims 42, 43, 45 and 46 as being unpatentable over Appelberg in view of Hora and further in view of Kobayaski U.S. Patent No. 5,229,628. Applicants respectfully disagree with the Examiner's reasoning and conclusions.

Appelberg discloses the concept of a split electrode lamp and also the concept of cutting (scribing) a groove in the rear electrode. First it is brought to the Examiner's attention that Applicants' EL lamp laminate material can be used for both split electrode lamp construction and parallel plate construction. The Examiner asserts that Kobayashi claims to use a diamond scribe to score or separate the 1 micron vapor deposited aluminum layer and the 15 micron current limiting layer. The Examiner then concludes that the Kobayashi scribing procedure is equivalent to the cutting of a groove in Applicants' EL lamp laminate material to create the split electrode

construction. Applicants submit the Examiner's conclusions and assertions are in error for at least the following reasons.

Kobayashi is scribing a 1 micron aluminum layer with a 12 micron current limiting layer. This current limiting layer is a combination of an insulting powder, such as barium titanate, and a conductive powder such as carbon black. **Kobayashi's layer is not designed as an insulating layer, but as a partially conductive layer**. The function of the layer in the Kobayashi construction is totally different than in Applicants' present invention and further it is very much thinner. The Examiner references Kobayashi at column 13, lines 12-16, where the specific reference is made to forming an undefined predetermined pattern. No mention is made of scribing to produce two electrically isolated areas.

The Examiner also references Figure 1, which refers to an EL dot-matrix display with column electrodes and row electrodes. The Kobayashi device is strictly a DC EL device with a designated anode and a designated cathode and therefore is only active when driven with a correct polarity (Column 2, Lines 8-12), typically a pulsed DC signal, which is incorporated into the designated drive scheme. In Kobayashi's structure, electrons are injected into the luminescent layer from the interface layer using a time division driving method of sequentially scanning lines along the row direction (Column 2, lines 14 – 20). This is an example of injection EL. In further contrast to Kobayashi which describes a stacked layer semiconductor device, the mechanism in Applicants' EL lamp laminate material is avalanche EL, which is a totally technically different mechanism than Kobayashi and therefore a different device. It should be noted that Kobayashi's preferred embodiment is a dot matrix display with defined rows and

columns. All other references in Kobayashi to device structures either refer to this row/column structure or to an undefined pattern. In no cases does Kobayashi disclose, suggest or teach a single cut in one of the electrodes to define a split electrode construction.

Although Kobayashi asserts his device can be driven with an AC signal, it can in fact only be driven at 50% duty cycle when the polarity is correct to drive the device as a half wave rectified pulsed DC signal. The Kobayashi device is not an AC device and may not function as an AC device and accordingly not able to capacitive couple adjoining segments to try to simulate a split electrode lamp. Also, as a DC EL device, this device requires high current density in the range of 100 mA/cm^2 (Column 9, Lines 13 –32). In contrast, Applicants' EL lamp laminate material which is strictly an AC EL device, is an example of avalanche EL, which is driven by an AC field in both directions and thus utilizes the full 100% duty cycle. As a result, a high voltage and an extremely low current powers Applicants' EL lamp laminate material. The current consumption of Applicants' EL lamp laminate material is in the order of 0.031 mA/cm^2.

In yet further contrast to the Kobayashi device, Applicants' EL lamp laminate material is driven or powered with an AC voltage and in a split electrode configuration it becomes a voltage divider. In essence, one side of the lamp is capacitively coupled to the other side, dividing the drive voltage by a proportion of the respective areas of the two sides. Although Kobayashi asserts his device can be driven with an AC signal, it can in fact only be driven at 50% duty cycle when the polarity is correct to drive the device as a half wave rectified pulsed DC signal. The Kobayashi device is not an AC device and may not function as an AC device and accordingly not able to capacitive couple adjoining segments to try to simulate a split electrode lamp. There is no

way one skilled in the art of EL lamp laminate material construction or operation can derive forming capacitively coupled sides from Kobayashi.

Further, in the 25 micron aluminum foil layer in Applicants' EL lamp laminate material, the diamond scribe technique suggested by the Examiner, if even possible, cannot be employed would be inoperable and not provide the intended result. A pointed object cannot be just dragged across the aluminum foil to create a gap as suggested by the Examiner, because the aluminum foil would shred leaving ripped metal projections along the parting line. Some of these projections will undoubtedly be touching each other across the gap causing direct shorts. In addition, when the lamp voltage is raised to 250 – 280 Volt AC to power the lamp, there will be considerable arcing across the projections along the parting line, making it impossible to maintain stable power to the lamp. Instead, material must be removed using a rotary saw device or other technique to create a consistent gap of a finite width such at 250 microns, although other gaps are also used. Also, the Kobayashi construction is fabricated on a glass substrate, which is much more suitable for using a diamond scribe than the flexible PET substrate disclosed in Applicants' invention. Applicants further submit that one skilled in the art of EL lamp laminate material fabrication or usage <u>would not be motivated</u> to look to the Kobayashi reference which deals with a totally different technology and operating principles to make the conclusions suggested by the Examiner.

Regarding claim 43, the Examiner asserts that Kobayashi claims that his device exhibits uniform brightness cutting the rear electrode layers to produce a split electrode lamp with at least two electrically isolated rear electrode areas. Applicants respectfully submit the Examiner's

conclusions are in error. Kobayashi teaches and discloses an EL dot-matrix display with column electrodes and row electrodes. Kobayashi is merely stating that in his disclosed construction, when connected to a dot matrix driver will produce pixels of uniform brightness across the display area. Kobayashi does not produce a split electrode lamp and he is not claiming exactly two (2) equal areas, which defines a split electrode construction.

Regarding claim 45, the Examiner asserts that Kobayashi teaches multiple cuts through the rear electrode layers and that is somehow equivalent to Applicants' multiple cuts in the rear electrode layer for producing multiple pairs of lamps for special effects. Applicants submit the Examiner's conclusions are in error for at least the following reasons.

Kobayashi teaches multiple cuts to create an EL dot-matrix display with multiple column electrodes and row electrodes. Kobayashi is merely stating that his disclosed construction, when connected to a dot matrix driver will produce pixels of sufficient number, suitable for a standard information display. Due to the high cost in creating his construction, Kobayashi will apply it to display text and perhaps graphics characters. It would be extremely expensive, if even possible, to use his technique for use as an accent lamp or to highlight a specific application, using special lighting effects. Applicants submit that the Examiner is comparing an information display to an EL panel lamp, which as submitted above are very different technologies at very different cost structures.

Regarding claim 46, the Examiner asserts that Kobayashi teaches every electrically isolated rear electrode area in conjunction with an electrical connector in contact with the aluminum foil is equivalent to the connectors as disclosed and claimed by Applicants.

Applicants submit that the Examiner's conclusions are in error for at least the following reasons.

Kobayashi teaches a EL dot-matrix display with column electrodes and row electrodes, and connections being made at the end of each column or row electrode. These electrodes must protrude out beyond the edges of the device in order to make connections. The area of this device must be known before construction and a part of the device must be reserved for making connections outside the light emitting area. As a display device this will have a limited size and be suitable for only displaying information content.

Applicants submit that Kobayashi does not teach, disclose or suggest Applicants' invention nor would one skilled in the EL art find motivation or reasoning in the references cited by the Examiner to make the modifications and combinations suggested by the Examiner, much less replicate Applicants' invention as disclosed and claimed for at least the reasoning set forth above.

Applicants' continuous roll EL lamp laminated material construction with an aluminum foil rear electrode is an unobvious improvement over prior art EL lamps. Prior art lamps build layers up either on a similar front substrate (ITO/PET) or on a similar rear substrate (aluminum foil). Lamps built up on a similar front substrate (ITO/PET) have a rear electrode deposited as a conductive coating. These conductive coatings are either not as conductive as aluminum foil (i.e. nickel acrylic) or if they are as conductive as aluminum foil they are extremely expensive (i.e. silver ink). EL lamps built up on a similar rear substrate (aluminum foil) have a front electrode deposited as a conductive coating which is neither as conductive or as transparent as ITO. In either of the above cases a superior electrode is paired up with an inferior or costly electrode. In

contrast, Applicants' continuous roll EL lamp laminate material as disclosed and claimed provides the best case electrode for both the front and rear sides, which permits large and extremely long EL lamps (26" – 54" wide and up to 1200' long or longer).

Applicants respectfully submit that independent claims 1, 11, 21 and 40 are technically and patentably distinguishable over the prior art cited by the Examiner for at least the limitation of a continuous roll EL lamp laminate material. None of the references cited teach, suggest or disclose the limitation of a continuous roll of EL lamp laminate material. The remaining claims of the application are dependent directly or indirectly on these independent claims which claims have been shown above to patentably distinguish over the prior art and it is submitted that these dependent claims are allowable for similar reasons and for limitations clearly set forth therein.

CONCLUSION

Applicants respectfully request favorable reconsideration and allowance of all the claims of the application is earnestly solicited at an early date.

Respectfully submitted,

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